

CLAIMS

1. A wireless line sharing network system in a mobile communication network system capable of a plurality of communications at licensed radio frequencies, comprising:

a plurality of user terminals that subscribe to a plurality of communication carriers, respectively;

a plurality of wireless base stations capable of communicating with the respective user terminals at the radio frequencies;

a control station for controlling the wireless base stations and connecting each of the user terminals to a corresponding communication carrier network; and

a call acceptance controller for, when there is a request for call connection to a user terminal, accepting the call as well as reserving bandwidth in response to the call connection request based on at least carrier band information indicating radio bandwidth allocation patterns defined by the respective communication carriers on a contract and carrier use condition information indicating the current use conditions of the bandwidth of the respective communication carriers, and updating the carrier use condition information.

2. The wireless line sharing network system as claimed in claim 1, wherein the call acceptance controller updates the bandwidth reserved by using licensed band information of a communication carrier network corresponding to the user terminal concerning the call connection request.

3. The wireless line sharing network system as claimed in claim 1, further comprising a bandwidth determination means for determining bandwidth for the call connection request based on bandwidth

commonly indicated in user support band information of the user terminal contained in the call connection request, licensed band information of a corresponding communication carrier network concerning the call connection request and carrier support band information on predetermined bands supported by the respective communication carriers with respect to each service.

4. The wireless line sharing network system as claimed in claim 3, wherein the bandwidth determination means includes:

a bandwidth list generation means for generating a list of at least one selectable bandwidth based on the user support band information, the licensed band information and the carrier support band information; and

a determination means for selecting bandwidth from the bandwidth list in descending order, and determining the selected bandwidth as bandwidth for the call connection request when the selected bandwidth is not greater than idle bandwidth obtained from the carrier use condition information.

5. The wireless line sharing network system as claimed in claim 1, further comprising a bandwidth change means for sequentially changing bandwidths allocated to call connected user terminals so that the used bandwidth of each of the communication carriers is in a predetermined range based on at least the carrier band information, the carrier use condition information and user use condition information indicating the current use conditions of the call connected ones of the user terminals.

6. The wireless line sharing network system as claimed in claim 4, further comprising a bandwidth change means for sequentially selecting call connected user terminals in descending order of bandwidths allocated to the user terminals based on user use condition information, and

changing the bandwidth allocated to the call connected user terminal so that the used bandwidth of each of the communication carriers is in a predetermined range according to the bandwidth list corresponding to the selected user terminal.

7. The network system as claimed in claim 1, further comprising a mediator controller for, in the case where bandwidth cannot be reserved for the call connection request, mediating between a communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth based on the carrier band information and the carrier use condition information so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

8. The network system as claimed in claim 1, further comprising a mediator controller for, in the case where the use of radio bandwidth exceeds the predetermined percentage of the radio bandwidth defined by contract in a communication carrier, mediating between the communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

9. The network system as claimed in claim 1, further comprising an accounting controller for charging each of the communication carriers based on the lease agreement concluded with the carrier.

10. An administrative apparatus for sharing a mobile communication network capable of a plurality of communications at

licensed radio frequencies among a plurality of communication carriers, the apparatus comprising:

- a first table for searchably storing carrier band information indicating radio bandwidth allocation patterns defined by the respective communication carriers on a contract;

- a carrier use condition memory for searchably storing carrier use condition information indicating the current use conditions of the bandwidth of the respective communication carriers;

- a user use condition memory for searchably storing user use condition information indicating the current use conditions of call connected ones of a plurality of user terminals that subscribe to the communication carriers, respectively; and

- a controller for controlling the used bandwidth of each of the communication carriers in units of at least bandwidth used by each user terminal based on the carrier band information, the carrier use condition information and the user use condition information, and updating the carrier use condition information and the user use condition information.

11. The administrative apparatus as claimed in claim 10, wherein the controller includes:

- a call acceptance controller for, when there is a request for call connection to a user terminal, accepting the call as well as reserving bandwidth in response to the call connection request based on at least the carrier band information indicating radio bandwidth allocation patterns defined by the respective communication carriers on a contract and the carrier use condition information indicating the current use conditions of the bandwidth of the respective communication carriers; and

- a bandwidth determination means for determining bandwidth for the call connection request based on bandwidth commonly indicated in user support band information of the user terminal contained in the call

connection request, licensed band information of a corresponding communication carrier network concerning the call connection request and carrier support band information on predetermined bands supported by the respective communication carriers with respect to each service.

12. The administrative apparatus as claimed in claim 11, wherein the bandwidth determination means includes:

a bandwidth list generation means for generating a list of at least one selectable bandwidth based on the user support band information, the licensed band information and the carrier support band information; and

a determination means for selecting bandwidth from the bandwidth list in descending order, and determining the selected bandwidth as bandwidth for the call connection request when the selected bandwidth is not greater than idle bandwidth obtained from the carrier use condition information.

13. The administrative apparatus as claimed in claim 10, wherein the controller further includes a bandwidth change means for sequentially changing bandwidths allocated to call connected user terminals so that the used bandwidth of each of the communication carriers is in a predetermined range based on at least the carrier band information, the carrier use condition information and user use condition information indicating the current use conditions of the call connected ones of the user terminals.

14. The administrative apparatus as claimed in claim 11, wherein the controller further includes a bandwidth change means for sequentially selecting call connected user terminals in descending order of bandwidths allocated to the user terminals based on user use condition information, and changing the bandwidth allocated to the call connected

user terminal so that the used bandwidth of each of the communication carriers is in a predetermined range according to the bandwidth list corresponding to the selected user terminal.

15. The administrative apparatus as claimed in claim 10, wherein the controller further includes a mediator controller for, in the case where bandwidth cannot be reserved for the call connection request, mediating between a communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth based on the carrier band information and the carrier use condition information so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

16. The administrative apparatus as claimed in claim 10, wherein the controller further includes a mediator controller for, in the case where the use of radio bandwidth exceeds the predetermined percentage of the radio bandwidth defined by contract in a communication carrier, mediating between the communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

17. The administrative apparatus as claimed in claim 10, wherein the controller further includes an accounting controller for charging each of the communication carriers based on the lease agreement concluded with the carrier.

18. An administrative method for sharing a mobile communication network capable of a plurality of communications at licensed radio frequencies among a plurality of communication carriers, the

method comprising the steps of:

searchably storing carrier band information indicating radio bandwidth allocation patterns defined by the respective communication carriers on a contract;

searchably storing carrier use condition information indicating the current use conditions of the bandwidth of the respective communication carriers;

searchably storing user use condition information indicating the current use conditions of call connected ones of a plurality of user terminals that subscribe to the communication carriers, respectively;

determining, when a user terminal requests call connection, whether or not there is idle bandwidth available for accommodating the call connection request based on the carrier band information and carrier use condition information;

forwarding, when there is idle bandwidth available for accommodating the call connection request, the call connection request to a communication carrier network corresponding to the user terminal;

determining bandwidth for the call connection request based on a response to the call connection request from the communication carrier network; and

updating the carrier use condition information and the user use condition information according to the determined bandwidth.

19. The administrative method as claimed in claim 18, further comprising the step of searchably storing carrier support band information on predetermined bands supported by the respective communication carriers with respect to each service, wherein bandwidth for the call connection request is determined based on bandwidth commonly indicated in user support band information of the user terminal contained in the call connection request, licensed band information contained in the response to

the call connection request from the communication carrier network and the carrier support band information.

20. The administrative method as claimed in claim 19, further comprising, in the step of determining bandwidth for the call connection request, the steps of:

generating a list of at least one selectable bandwidth based on the user support band information, the licensed band information and the carrier support band information;

selecting bandwidth from the bandwidth list in descending order;
and

determining the selected bandwidth as bandwidth for the call connection request when the selected bandwidth is not greater than idle bandwidth obtained from the carrier use condition information.

21. The administrative method as claimed in claim 18, further comprising the step of sequentially changing bandwidths allocated to call connected user terminals so that the used bandwidth of each of the communication carriers is in a predetermined range based on at least the carrier band information, the carrier use condition information and the user use condition information.

22. The administrative method as claimed in claim 20, further comprising the steps of sequentially selecting call connected user terminals in descending order of bandwidths allocated to the user terminals based on user use condition information; and

changing the bandwidth allocated to the call connected user terminal so that the used bandwidth of each of the communication carriers is in a predetermined range according to the bandwidth list corresponding to the selected user terminal.

23. The administrative method as claimed in claim 18, further comprising the step of, in the case where bandwidth cannot be reserved for the call connection request, mediating between a communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth based on the carrier band information and the carrier use condition information so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

24. The administrative method as claimed in claim 18, further comprising the step of, in the case where the use of radio bandwidth exceeds the predetermined percentage of the radio bandwidth defined by contract in a communication carrier, mediating between the communication carrier with insufficient bandwidth and a communication carrier with excess bandwidth so that the communication carrier with excess bandwidth leases idle bandwidth to the communication carrier with insufficient bandwidth.

25. The administrative method as claimed in claim 18, further comprising the step of charging each of the communication carriers based on the lease agreement concluded with the carrier.

26. A computer program for sharing a mobile communication network capable of a plurality of communications at licensed radio frequencies among a plurality of communication carriers, the computer program causing a computer to perform the steps of:

searchably storing carrier band information indicating radio bandwidth allocation patterns defined by the respective communication carriers on a contract;

searchably storing carrier use condition information indicating

the current use conditions of the bandwidth of the respective communication carriers;

searchably storing user use condition information indicating the current use conditions of call connected ones of a plurality of user terminals that subscribe to the communication carriers, respectively;

determining, when a user terminal requests call connection, whether or not there is idle bandwidth available for accommodating the call connection request based on the carrier band information and carrier use condition information;

forwarding, when there is idle bandwidth available for accommodating the call connection request, the call connection request to a communication carrier network corresponding to the user terminal;

determining bandwidth for the call connection request based on a response to the call connection request from the communication carrier network; and

updating the carrier use condition information and the user use condition information according to the determined bandwidth.